

REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicant thanks the Examiner for carefully considering this application.

Disposition of the Claims

Claims 1-9 and 11-47 are pending in the application. Claims 1, 16, 18, 40, and 41 are independent. The remaining claims depend, directly or indirectly, from claims 1, 16, 18, 40, and 41.

Claim Amendments

Claims 1, 16, 18, 40, and 41 have been amended by this reply to clarify the present invention recited. Support for these amendments can be found in FIGS. 6A-6B and 7A-7D, at least. No new matter has been added. Additionally, claims 2, 9, 17, 27, and 31-39 have been cancelled by this reply.

Rejection(s) under 35 U.S.C. § 102

Claims 1-4, 7-9, 14, 16-19, 22-24, 27, and 40 stand rejected under 35 U.S.C. § 102 as anticipated by U.S. Patent No. 4,718,505 issued to Fuller (“Fuller”). To the extent that this rejection still applies to the claims as amended, the rejection is respectfully traversed.

Claims 1, 16, 18, and 40 recite drill bit inserts, drill bits, and a method of drilling, all comprising inserts having a diamond-impregnated insert body and a thermally stable shearing portion disposed on said diamond-impregnated insert body, where the thermally stable shearing portion includes thermally stable polycrystalline diamond, and where at least a portion of the

diamond-impregnated insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert.

Fuller discloses a drill bit where each cutting element includes a thin polycrystalline diamond hardfacing layer bonded to a thicker backing of tungsten carbide. Each cutting element is bonded to a stud which is received in a socket in the bit body. An abrasion element impregnated with diamond particles may alternatively be spaced rearwardly of each of these cutting elements and comprise a separated stud that is received in a socket in the bit body or be incorporated into the cutting element's support stud.

Fuller does not disclose nor teach a drill bit insert with a diamond-impregnated insert body and a thermally stable shearing portion disposed thereon, where at least a portion of the diamond-impregnated insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert. Rather, the diamond impregnated abrasion element of Fuller is located behind the cutting element such that no portion of the abrasion element forms, along with the thermally stable shearing element, a leading edge of the inset. Advantageously, embodiments of the present invention provide for a cutting element that can both "grind" and "shear" a formation, to increase the overall rate of penetration and/or wear resistance of a bit and to provide better results when drilling formations having both hard and soft characteristics, such as sand/shale formations.

For a claim to be anticipated, "every element and limitation of the claimed invention must be found in a single prior art reference, arranged as in the claim." *Brown v. 3M*, 265 F.3d 1349, 1351 (Fed. Cir. 2001). In view of the above, Fuller fails to teach each limitation recited in claims 1, 16, 18, and 40, as is required to support a rejection under § 102. Thus,

claims 1, 16, 18, and 40 are patentable over Fuller. Dependent claims are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 41-44 and 46 stand rejected under 35 U.S.C. § 102 as anticipated by U.S. Patent Nos. 5,351,770 issued to Cawthorne, et al. (“Cawthorne”). To the extent that this rejection still applies to the claim as amended, the rejection is respectfully traversed.

Claim 41 recites a composite cutting element for a drill bit comprising of an abrasive insert body having a mixture of ultra-hard material and a less abrasion resistant matrix material, where the ultra-hard material is impregnated in the matrix of the less abrasion resistant material, and a thermally stable shearing element on the insert body, where the thermally stable shearing portion includes thermally stable polycrystalline diamond, and where at least a portion of the abrasive insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert.

Cawthorne discloses a rock bit comprising cutting elements that may have a diamond layer disposed on a tungsten carbide body, where the body may be formed from a composite of tungsten carbide impregnated with diamond particles. Cawthorne does not teach a cutting element having a thermally stable shearing element on an abrasive insert body, where the thermally stable shearing element is comprised of thermally stable polycrystalline diamond. While Cawthorne discloses using a diamond disk or hard cutter element, Cawthorne remains silent as to the use of thermally stable polycrystalline diamond. Furthermore, while the Examiner states that because Cawthorne’s shearing elements are made of the same material (PCD) from which the claimed shearing element are made, Cawthorne discloses a thermally stable shearing element, Applicant respectfully notes that polycrystalline diamond and thermally stable polycrystalline diamond are two distinct materials. Polycrystalline diamond refers to a

mass of individual diamond crystals that are interconnected to form an integral lattice structure. Within the interstitial spaces of the diamond lattice, cobalt particles (or any other metal binder that may be used) may be found. However, because cobalt has a significantly different coefficient of thermal expansion as compared to diamond, upon exposure of elevated temperatures, a lattice polycrystalline diamond will often crack as a result of the cobalt expansion. Thermally stable polycrystalline diamond, on the other hand, may be formed in one method by leaching a polycrystalline diamond lattice structure with a strong acid. This leaching will remove cobalt from at least a portion of the diamond lattice to form a more heat resistant diamond layer, as compared to polycrystalline diamond.

Additionally, Cawthorne also fails to teach a drill bit insert having an abrasive insert body and a thermally stable shearing portion on said insert body, where at least a portion of the abrasive insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert. Rather, every insert of Cawthorne having a diamond cutter element shows only diamond forming the leading edge of the insert, such that no portion of the insert body forms, along with a thermally stable shearing element, a leading edge of the inset. As described above, embodiments of the present invention advantageously provide for a cutting element that can both "grind" and "shear" a formation, to increase the overall rate of penetration and/or wear resistance of a bit and to provide better results when drilling formations having both hard and soft characteristics, such as sand/shale formations.

In view of the above, Cawthorne fails to teach each limitation recited in claim 41, as is required to support a rejection under § 102. Thus, claim 41 is patentable over Cawthorne. Dependent claims are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 41 and 45 stand rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,217,081 issued to Waldenstrom, et al. (“Waldenstrom”). To the extent that this rejection still applied to the claims as amended, the rejection is respectfully traversed.

As discussed above, claim 41 recites a composite cutting element for a drill bit comprising an abrasive insert body having a mixture of ultra-hard material and a less abrasion resistant matrix material, where the ultra-hard material is impregnated in the matrix of the less abrasion resistant material, and a thermally stable shearing element on the insert body, where the thermally stable shearing portion includes thermally stable polycrystalline diamond, and where at least a portion of the abrasive insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert.

Waldenstrom discloses a rock cutter insert comprising a body of cemented carbide having a layer or body of diamond or cubic boron nitride (CBN) bonded to the carbide body. The cutting elements of Waldenstrom are formed in a sequential process whereby the carbide portion is initially sintered, and subsequently, the layer or body of diamond or CBN is attached to the pre-sintered cemented carbide by a second sintering process. Waldenstrom does not show a cutting having *both* an abrasive insert body that has an ultra-hard material impregnated within a less abrasion resistant matrix material *and* a thermally stable shearing portion on the abrasive insert body. Rather, the only teaching with respect to diamond or CBN in Waldenstrom specifies that a layer or body of diamond is disposed in or on the surface of the carbide body depending on whether the diamond layer partly or completely covers the insert body. While the Examiner cites to column 3, lines 48-58 and FIG. 2a, reference 3 as providing support for the assertion that Waldenstrom shows both an abrasive body having a mixture of diamond and/or CBN crystals cemented with carbides and a thermally stable shearing portion,

Applicant respectfully notes that the diamond and/or CBN crystals referred to in column 3 of Waldenstrom comprise the layer referred to as reference 3 in all Waldenstrom figures. Thus, Waldenstrom fails to teach a cutting element that includes an abrasive insert body, where the insert body includes a mixture of ultra-hard material and a less abrasion resistant matrix material, where the ultra-hard material is impregnated in the matrix of the less abrasion resistant material, and a thermally stable shearing portion on the abrasive body.

In view of the above, Waldenstrom fails to teach each limitation recited in claim 41, as is required to support a rejection under § 102. Thus, claim 41 is patentable over Waldenstrom. Dependent claims are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Rejection(s) under 35 U.S.C. § 103

Claims 5-6, 11-13, 25-26, and 28-30 stand rejected under 35 U.S.C. § 103 as being unpatentable over Fuller in view of U.S. Patent No. 5,279,374 (“Siever”). To the extent that this rejection still applies to the claims as amended, the rejection is respectfully traversed.

As discussed above with respect to claims 1, 16, and 18, from which claims 5-6, 11-13, 25-26, and 28-30 depend, Fuller neither shows nor suggests a diamond impregnated insert body and a thermally stable shearing portion disposed thereon, where the thermally stable shearing portion includes thermally stable polycrystalline diamond, and where at least a portion of the diamond-impregnated insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert, as recited in claims 1, 16, and 18. Siever, which the Examiner only asserts as teaching a tungsten carbide coating, does not provide that which Fuller lacks, with respect to independent claims 1, 16, and 18.

In view of the above, Fuller and Siever, whether considered separately or in combination, fail to show or suggest the present invention as recited in claims 1, 16, and 18. Thus, claims 1, 16, and 18 are patentable over Fuller and Siever. Claims 5-6, 11-13, 25-26, and 28-30, which depend from claims 1, 16, and 18 respectively, are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 15 stands rejected under 35 U.S.C. § 103 as being unpatentable over Fuller. To the extent this rejection still applies to the claims as amended, the rejection is respectfully traversed.

As demonstrated above, Fuller fails to teach the present invention as recited in claims 1. Thus, claim 1 is patentable over Fuller. Claim 15, which depends from claim 1, is allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 20-21 stand rejected under 35 U.S.C. § 103 as being unpatentable over Fuller in view of U.S. Patent No. 6,193,000 ("Caraway"). This rejection is respectfully traversed.

As discussed above with respect to claim 18, from which claims 20-21 depend, Fuller neither shows or suggests a diamond impregnated insert body and a thermally stable shearing portion disposed thereon, where the thermally stable shearing portion includes thermally stable polycrystalline diamond, and where at least a portion of the diamond-impregnated insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert, as recited in claim 18. Caraway, which the Examiner only asserts as

teaching a bit body made of diamond impregnated tungsten carbide matrix, does not provide that which Fuller lacks, with respect to independent claims 18.

In view of the above, Fuller and Caraway, whether considered separately or in combination, fail to show or suggest the present invention as recited in claim 18. Thus, claim 18 is patentable over Fuller and Caraway. Claims 20-21, which depend from claim 18, are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 47 stands rejected under 35 U.S.C. § 103 as being unpatentable over Cawthorne in view of U.S. Patent No. 5,045,092 ("Keshavan"). This rejection is respectfully traversed.

As discussed above with respect to claim 41, from which claim 47 depends, Cawthorne neither shows or suggests an abrasive insert body and a thermally stable shearing portion on said insert body, where the thermally stable shearing portion includes thermally stable polycrystalline diamond, and where at least a portion of the abrasive insert body and at least a portion of the thermally stable shearing portion form a leading edge of the insert as recited in claim 41. Keshavan, which the Examiner only asserts as teaching that the diamond concentration within the cutter can be varied, does not provide that which Cawthorne lacks, with respect to independent claim 41.

In view of the above, Cawthorne and Keshavan, whether considered separately or in combination, fail to show or suggest the present invention as recited in claim 41. Thus, claim 41 is patentable over Cawthorne and Keshavan. Claim 47, which depends from claim 41, is

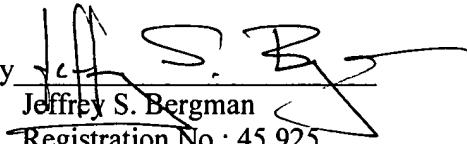
allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 05516/147002).

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Respectfully submitted,

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Attachments